

Amendments to the Claims:

Claims 12-15, 27-30, and 37-49 have been canceled without prejudice. This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Previously Presented) A computer-implemented method of determining if a query element is included in a set of elements comprising one or more elements from a first domain having a character set of "m" characters, wherein "Z" is the maximum possible length of an element in the first domain and "Y" is the length of the longest element in the set of elements such that $1 \leq Y \leq Z$, the method comprising:

building a data structure based upon the set of elements, the data structure comprising a plurality of memory structures headed by a root memory structure, each memory structure in the plurality of memory structures comprising a first memory location and an array of "m" memory locations;

receiving information identifying the query element; and

using the data structure to determine if the query element is included in the set of elements such that the number of comparisons needed to determine if the query element is included in the set of elements is proportional to a length of the query element and independent of the number of elements in the set of elements.

2. (Original) The method of claim 1 wherein the query element is of length "q" and at most "q" character comparisons are needed to determine if the query element is included in the set of elements.

3. (Canceled)

4. (Previously Presented) The method of claim 1 wherein:
the data structure comprises a total of (Y+1) levels; and

each memory structure in the data structure belongs to a level L , where $(0 \leq L \leq Y)$, the level for a particular memory structure denoting the number of memory structures, starting with the root memory structure, that have to be traversed to reach the particular memory structure, the root memory structure belonging to level 0.

5. (Previously Presented) The method of claim 4 wherein building the data structure based upon the set of elements comprises:

for each element "R" in the set of elements, where $R = c_1c_2...c_f$ for some $f \leq Y$,
for each c_i where $1 \leq i \leq f$, starting with $i = 1$:

- (a) selecting a memory structure at level " $(i-1)$ ";
- (b) if a memory location corresponding to character c_i in the array of memory locations of the presently selected memory structure does not refer to another memory structure in the database, storing an address of a new memory structure at level " i " in the memory location corresponding to character c_i in the array of memory locations of the selected memory structure;
- (c) selecting the memory structure at level " i " whose address is stored in the memory location corresponding to character c_i in the array of memory locations of the presently selected memory structure;
- (d) if (" i " is equal to " f "), storing a reference to element "R" in the first memory location of the memory structure selected in step (c);
- (e) incrementing the value of " i " by one; and
- (f) repeating steps (b), (c), (d), and (e) for each c_i where (" i " \leq " f ").

6. (Original) The method of claim 5 wherein:

receiving information identifying the query element comprises:

receiving information identifying a query element k , where $k = c_1c_2...c_q$
for some $q \leq Z$;

using the data structure to determine if the query element is included in the set of elements comprises:

for each c_i of k where $1 \leq i \leq f$, starting with $i = 1$:

(a) selecting a memory structure of the database at level “(i-1)”;

(b) if a memory location corresponding to character c_i in the array of memory locations of the presently selected memory structure does not refer to another memory structure in the database, outputting a signal indicating that the query element is not included in the set of elements;

(c) if the memory location corresponding to character c_i in the array of memory locations of the presently selected memory structure stores an address of a memory structure of the database at level “i”, selecting the memory structure at level “i” whose address is stored;

(d) incrementing the value of “i” by one; and

(e) repeating steps (b), (c), and (d) while (“i” \leq “q”) and the signal indicating that the query element is not included in the set of elements has not been output; and if the signal indicating that the query element is not included in the set of elements has not been output:

determining if the first memory location of the memory structure selected in step (c) refers to the query element; and

if the first memory location of the memory structure selected in step (c) refers to the query element, outputting a signal indicating that the query element is included in the set of elements, else outputting a signal indicating that the query element is not included in the set of elements.

7. (Previously Presented) The method of claim 1 wherein building the data structure based upon the set of elements comprises:

for each element “R” in the set of elements, where $R = c_1c_2...c_f$ for some $f \leq Y$, where each character c_i belongs to the character set of domain, and $1 \leq i \leq f$, storing information in the database indicating the position and identity of each character in element R.

8. (Original) The method of claim 7 wherein using the data structure to determine if the query element is included in the set of elements comprises:

determining if the query element is included in the set of elements based upon information stored by the database and information identifying characters and their positions in the query element.

9. (Previously Presented) The method of claim 1 wherein building the data structure based upon the set of elements comprises:

for each element "R" in the set of elements:

(a) selecting the root memory structure of the data structure as the selected memory structure;

(b) selecting the first character of element R;

(c) if a memory location corresponding to the selected character in the array of memory locations of the selected memory structure does not refer to another memory structure in the data structure, storing an address of a new memory structure in the memory location corresponding to the selected character in the array of memory locations of the presently selected memory structure;

(d) selecting the memory structure whose address is stored in the memory location corresponding to the selected character in the array of memory locations of the selected memory structure as the selected memory structure; and

(e) if the selected character is the last character of element R, storing a reference to element R in the first memory location of the memory structure selected in step (d), else, selecting the next character of element R, and repeating steps (c), (d), and (e).

10. (Original) The method of claim 9 wherein using the data structure to determine if the query element is included in the set of elements comprises:

(a) selecting the root memory structure of the data structure as the selected memory structure;

(b) selecting the first character of the query element;

(c) if a memory location corresponding to the selected character in the array of memory locations of the selected memory structure does not refer to another memory structure in the data structure, outputting a signal indicating that the query element is not included in the set of elements,

else, selecting the memory structure whose address is stored as the selected memory element; and

(d) if the selected character is the last character of the query element:

determining if the first memory location of the memory structure selected in step (c) refers to the query element; and

if the first memory location of the memory structure selected in step (c) refers to the query element, outputting a signal indicating that the query element is included in the set of elements, else outputting a signal indicating that the query element is not included in the set of elements;

else:

selecting the next character of the query element , and repeating steps (c) and (d).

11. (Original) The method of claim 1 wherein a size of the data structure is independent of the number of elements in the set of elements.

12.- 15. (Canceled)

16. (Previously Presented) A system for determining if a query element is included in a set of elements comprising one or more elements from a first domain having a character set of "m" characters, wherein "Z" is the maximum possible length of an element in the first domain and "Y" is the length of the longest element in the set of elements such that $1 \leq Y \leq Z$, the system comprising:

a processor;

a memory coupled to the processor, the memory configured to store a plurality of code modules executable by the processor, the plurality of code modules comprising:

a code module for building a data structure based upon the set of elements, the data structure comprising a plurality of memory structures headed by a root memory structure, each memory structure in the plurality of memory structures comprising a first memory location and an array of "m" memory locations;

a code module for receiving information identifying the query element;

and

a code module for using the data structure to determine if the query element is included in the set of elements such that the number of comparisons needed to determine if the query element is included in the set of elements is proportional to a length of the query element and independent of the number of elements in the set of elements.

17. (Original) The system of claim 16 wherein the query element is of length "q" and at most "q" character comparisons are needed to determine if the query element is included in the set of elements.

18. (Canceled)

19. (Previously Presented) The system of claim 16 wherein:

the data structure comprises a total of (Y+1) levels; and

each memory structure in the data structure belongs to a level L, where $(0 \leq L \leq Y)$, the level for a particular memory structure denoting the number of memory structures, starting with the root memory structure, that have to be traversed to reach the particular memory structure, the root memory structure belonging to level 0.

20. (Previously Presented) The system of claim 19 wherein the code module for building the data structure based upon the set of elements comprises:

for each element "R" in the set of elements, where $R = c_1c_2...c_f$ for some $f \leq Y$, for each c_i where $1 \leq i \leq f$, starting with $i = 1$:

- (a) a code module for selecting a memory structure at level “(i-1)”;
- (b) if a memory location corresponding to character c_i in the array of memory locations of the presently selected memory structure does not refer to another memory structure in the database, a code module for storing an address of a new memory structure at level “i” in the memory location corresponding to character c_i in the array of memory locations of the selected memory structure;
- (c) a code module for selecting the memory structure at level “i” whose address is stored in the memory location corresponding to character c_i in the array of memory locations of the presently selected memory structure;
- (d) if (“i” is equal to “f”), a code module for storing a reference to element “R” in the first memory location of the memory structure selected in step (c);
- (e) a code module for incrementing the value of “i” by one; and
- (f) a code module for repeating steps (b), (c), (d), and (e) for each c_i where (“i” ≤ “f”).

21. (Original) The system of claim 20 wherein:

the code module for receiving information identifying the query element comprises:

a code module for receiving information identifying a query element k ,
where $k = c_1c_2...c_q$ for some $q \leq Z$;

the code module for using the data structure to determine if the query element is included in the set of elements comprises:

for each c_i of k where $1 \leq i \leq f$, starting with $i = 1$:

- (a) a code module for selecting a memory structure of the database at level “(i-1)”;
- (b) if a memory location corresponding to character c_i in the array of memory locations of the presently selected memory structure does not refer to another memory structure in the database, a code module for outputting a signal indicating that the query element is not included in the set of elements;

(c) if the memory location corresponding to character c_i in the array of memory locations of the presently selected memory structure stores an address of a memory structure of the database at level "i", a code module for selecting the memory structure at level "i" whose address is stored;

(d) a code module for incrementing the value of "i" by one; and

(e) a code module for repeating steps (b), (c), and (d) while ("i" \leq "q") and the signal indicating that the query element is not included in the set of elements has not been output; and

if the signal indicating that the query element is not included in the set of elements has not been output:

a code module for determining if the first memory location of the memory structure selected in step (c) refers to the query element; and

if the first memory location of the memory structure selected in step (c) refers to the query element, a code module for outputting a signal indicating that the query element is included in the set of elements, else a code module for outputting a signal indicating that the query element is not included in the set of elements.

22. (Previously Presented) The system of claim 16 wherein the code module for building the data structure based upon the set of elements comprises:

for each element "R" in the set of elements, where $R = c_1c_2...c_f$ for some $f \leq Y$, where each character c_i belongs to the character set of domain, and $1 \leq i \leq f$, a code module for storing information in the database indicating the position and identity of each character in element R.

23. (Original) The system of claim 22 wherein the code module for using the data structure to determine if the query element is included in the set of elements comprises:

a code module for determining if the query element is included in the set of elements based upon information stored by the database and information identifying characters and their positions in the query element.

24. (Previously Presented) The system of claim 16 wherein the code module for building the data structure based upon the set of elements comprises:

for each element "R" in the set of elements:

- (a) a code module for selecting the root memory structure of the data structure as the selected memory structure;
- (b) a code module for selecting the first character of element R;
- (c) if a memory location corresponding to the selected character in the array of memory locations of the selected memory structure does not refer to another memory structure in the data structure, a code module for storing an address of a new memory structure in the memory location corresponding to the selected character in the array of memory locations of the presently selected memory structure;
- (d) a code module for selecting the memory structure whose address is stored in the memory location corresponding to the selected character in the array of memory locations of the selected memory structure as the selected memory structure; and
- (e) if the selected character is the last character of element R, a code module for storing a reference to element R in the first memory location of the memory structure selected in step (d),
else, a code module for selecting the next character of element R, and repeating steps (c), (d), and (e)

25. (Original) The system of claim 24 wherein the code module for using the data structure to determine if the query element is included in the set of elements comprises:

- (a) a code module for selecting the root memory structure of the data structure as the selected memory structure;
- (b) a code module for selecting the first character of the query element;
- (c) if a memory location corresponding to the selected character in the array of memory locations of the selected memory structure does not refer to another memory structure in the data structure, a code module for outputting a signal indicating that the query element is not included in the set of elements,

else, a code module for selecting the memory structure whose address is stored as the selected memory element; and

(d) if the selected character is the last character of the query element:

a code module for determining if the first memory location of the memory structure selected in step (c) refers to the query element; and

if the first memory location of the memory structure selected in step (c) refers to the query element, a code module for outputting a signal indicating that the query element is included in the set of elements, else a code module for outputting a signal indicating that the query element is not included in the set of elements;

else:

a code module for selecting the next character of the query element , and repeating steps (c) and (d).

26. (Original) The system of claim 16 wherein a size of the data structure is independent of the number of elements in the set of elements.

27. - 30. (Canceled)

31. (Previously Presented) A computer program product stored on a computer-readable storage medium for determining if a query element is included in a set of elements comprising one or more elements from a first domain having a character set of "m" characters, wherein "Z" is the maximum possible length of an element in the first domain and "Y" is the length of the longest element in the set of elements such that $1 \leq Y \leq Z$, the computer program product comprising:

code for building a data structure based upon the set of elements, the data structure comprising a plurality of memory structures headed by a root memory structure, each memory structure in the plurality of memory structures comprising a first memory location and an array of "m" memory locations;

code for receiving information identifying the query element; and

code for using the data structure to determine if the query element is included in the set of elements such that the number of comparisons needed to determine if the query element is included in the set of elements is proportional to a length of the query element and independent of the number of elements in the set of elements.

32. (Original) The computer program product of claim 31 wherein the query element is of length "q" and at most "q" character comparisons are needed to determine if the query element is included in the set of elements.

33. (Canceled)

34. (Previously Presented) The computer program product of claim 31 wherein:

the data structure comprises a total of (Y+1) levels; and

each memory structure in the data structure belongs to a level L, where ($0 \leq L \leq Y$), the level for a particular memory structure denoting the number of memory structures, starting with the root memory structure, that have to be traversed to reach the particular memory structure, the root memory structure belonging to level 0.

35. (Previously Presented) The computer program product of claim 31 wherein the code for building the data structure based upon the set of elements comprises:

for each element "R" in the set of elements, where $R = c_1 c_2 \dots c_f$ for some $f \leq Y$, where each character c_i belongs to the character set of the first domain, and $1 \leq i \leq f$, code for storing information in the database indicating the position and identity of each character in element R.

36. (Original) The computer program product of claim 35 wherein the code for using the data structure to determine if the query element is included in the set of elements comprises:

Appl. No. 10/006,179

PATENT

Amdt. dated February 1, 2005

Reply to Office Action of December 8, 2004

code for determining if the query element is included in the set of elements based upon information stored by the database and information identifying characters and their positions in the query element.

37. - 49. (Canceled)